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PATENT ABSTRACTS OF JAPAN

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(71)Applicant : NEC CORP
(72)Inventor : OSHIMA TSUTOMU

(54) MANUFACTURE OF CHARGEABLE POWDER FOR CIRCUIT FORMATION

(57)Abstract:
PURPOSE: To provide a manufacturing method for increasing dispersibility of a metal particle and a charge controlling agent in fusible resin, which are contained in chargeable powder for the circuit formation of a wiring substrate.
CONSTITUTION: A metal particle, a fusible resin particle made by pulverizing the fusible resin and a charge controlling agent particle are used for chargeable powder. They are mixed with each other (process 11), then heated and compressed to make a pressed body (process 12), the pressed body is pulverized into particles (process 13, 14), and then classified (process 15), thereby providing a chargeable particle having the desired particle diameter.

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[Date of requesting appeal against examiner's decision of

rejection]
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CLAIMS

[Claim(s)]
[Claim 1] The manufacture technique of the electric-charge nature powder for circuit formation characterized by having the process which mixed the metal particle, the thermofusion nature resin particle, and the electric-charge control agent particle, and which carries out afterbaking pressurization and is used as the press field, and the process which pulverizes and classifies the aforementioned press field and is used as powder.
[Claim 2] The manufacture technique of the electric-charge nature powder for circuit formation according to claim 1 that the mean particle diameter of a metal particle, a thermofusion nature resin particle, and an electric-charge control agent particle is characterized by being smaller than electric-charge nature powder.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] In case this invention forms a wiring pattern by the dry-type xerography especially on a wiring substrate about the manufacture technique of the electric-charge nature powder for circuit formation, it relates to the manufacture technique of the electric-charge nature powder for circuit formation of a wiring substrate used as a toner.
[0002]
[Description of the Prior Art] There was a method of printing a metal paste on an insulating substrate by screen-stencil, and calcinating it as the circuit formation technique of a wiring substrate.
[0003] On the other hand, the technique of forming a circuit on an insulating substrate using a dry-type xerography is proposed in the electric-charge nature powder which contains a metal flour child for the purpose of a manufacturing cost reduction and production time compaction. As the conventional manufacture technique of this electric-charge nature powder, it is proposed by Japanese Patent Application No. 80083 [one to].
[0004] **Error! Bookmark not defined.** is a process flow view showing the manufacture technique of this electric-charge nature powder. It mixes first with the compounding ratio of a request of a metal particle, a thermofusion nature resin, and an electric-charge control agent, and after carrying out the thermofusion of this with a kneader and kneading it, coarse grinding by the hammer mill and the powder which performs the pulverizing according to a jet mill further, and has central particle size distribution [particle size / desired] mostly are obtained. This is applied to a draft classifier, is classified and the electric-charge nature powder for circuit formation of the circuit board with the particle size of request within the limits is obtained.
[0005]
[Problem(s) to be Solved by the Invention] By the manufacture technique of the electric-charge nature powder for the conventional circuit formation mentioned above, since it is difficult to distribute a metal particle uniformly in a thermofusion nature resin at the time of kneading, it becomes the electric-charge nature powder with which what has the excessive content of the metal particle 1, the thing which run short as shown in **Error! Bookmark not defined.** (B), and the thing which is not contained at all as shown in **Error! Bookmark not defined.** (C) were intermingled after trituration and classification as shown in **Error! Bookmark not defined.** (A).
[0006] If a wiring pattern is formed by the xerography using such electric-charge nature powder, the electrification status of electric-charge nature powder will become uneven, and the development to an electrostatic latent image will also become uneven.

[0007] Consequently, a fogging is produced to a wiring pattern and there is a trouble of becoming the short-circuit during a wiring and the cause of a fall of insulation resistance, or producing a break and a blur to a wiring pattern and becoming an open circuit of a wiring and the cause of resistance increase.
[0008] It is in the purpose of this invention offering the manufacture technique of the electric-charge nature powder for circuit formation of equalizing the content of the metal particle to electric-charge nature powder, and an electric-charge control agent conventionally, and having enabled it to obtain a uniform wiring pattern the trouble mentioned above being solved.
[0009]
[Means for Solving the Problem] The manufacture technique of the electric-charge nature powder for circuit formation of this invention is equipped with the process which mixed the metal particle, the thermofusion nature resin particle, and the electric-charge control agent particle and which carries out afterbaking pressurization and is used as the press field, and the process which pulverizes and classifies the aforementioned press field and is used as powder, and is constituted.
[0010]
[Example] Next, the example of this invention is explained with reference to a drawing.
[0011] **Error! Bookmark not defined.** is a process flow view showing one example of the manufacture technique of the electric-charge nature powder for circuit formation of this invention.
[0012] First, the metal particle and thermofusion nature resin particle which are the material of electric-charge nature powder, and an electric-charge control agent particle are mixed.
[0013] At this time, a mean particle diameter is 0.5 as a metal particle. A mean particle diameter uses the azo system metallized dye which is about 4 micrometers in the silver dust end of the shape of flakes of mum as the particle which pulverized a styrene-acrylic copolymer and low molecular weight polypropylene with the jet mill, and set the mean particle diameter to about 5 micrometers as a thermofusion nature resin particle, and an electric-charge control agent particle.
[0014] This is blended by the weight ratio of 80:19:(styrene-acrylic copolymer:low-molecular-weight-polypropylene =18:1) 1, and carries out distributed mixture uniformly by the high speed mixer (process 11). The homogeneity of the content of the metal impalpable powder to electric-charge nature powder is mostly determined at this process, and becomes as good [the particle diameter of each material] as the parvus.
[0015] Next, this is put into metal mold, heating pressurization is carried out with a heated type press machine, and it considers as the press field (process 12).
[0016] Next, after carrying out coarse grinding of this press field by the cutter mill (process 13) and pulverizing it with a jet mill (process 14), it classifies and the electric-charge nature powder whose mean particle diameter (process 15) is about 15 micrometers is obtained. **Error! Bookmark not defined.** is a ** type view of this electric-charge nature powder. The metal particle 1 and the electric-charge control agent 3 are distributing uniformly in the thermofusion nature resin 2.
[0017] **Error! Bookmark not defined.** (A) is drawing showing the microphotography of the cross section of the Plastic solid in this example, and **Error! Bookmark not defined.** (B) is drawing showing the microphotography of the cross section of the kneader kneading object in the conventional technique. The dispersibility of the silver in the Plastic solid by this example is very good compared with the dispersibility of the metal particle in the kneader kneading object in the conventional technique.
[0018] The **Error! Bookmark not defined.** (A) and (B) are the particle-size-distribution views by the Coulter counter of the electric-charge nature powder by this example, and the **Error! Bookmark not defined.** (C) and (D) are the particle-size-distribution views of the electric-charge nature powder by the conventional technique. Since a classification is a draft method and it is strongly influenced of the specific gravity of electric-charge nature powder, the degree distribution of grain with the uneven content of the metal particle of electric-charge nature powder becomes large, and a uniform particle size is not obtained. Compared with the electric-charge nature powder by the conventional technique, since the content of a metal particle is uniform, particle size distribution (the **Error! Bookmark not defined.** (A) and (B)) are narrow, and the electric-charge nature powder by this example has good influence also on printing nature.
[0019] This electric-charge nature powder was printed on the ceramic green sheet by the electrophotography method using the ferrite system carrier, and was used as the ceramic substrate a disconnection, a laminating, and by calcinating. The sheet resistance of the circuit of this ceramic substrate was 2-3mohm and about [conventional] 1/5.
[0020]
[Effect of the Invention] As explained above, since the manufacture technique of the electric-charge nature powder for circuit formation of this invention can make uniform the content of the metal particle of electric-charge nature

powder, it has the effect that the good electric-charge nature powder of the printing nature which each powder is electrified uniformly and can print a uniform wiring pattern at the time of electrophotography printing can be obtained.

Field

[Field of the Invention] In case this invention forms a wiring pattern by the dry-type xerography especially on a wiring substrate about the manufacture technique of the electric-charge nature powder for circuit formation, it relates to the manufacture technique of the electric-charge nature powder for circuit formation of a wiring substrate used as a toner.

Technique

[Description of the Prior Art] There was a method of printing a metal paste on an insulating substrate by screen-stencil, and calcinating it as the circuit formation technique of a wiring substrate.
[0003] On the other hand, the technique of forming a circuit on an insulating substrate using a dry-type xerography is proposed in the electric-charge nature powder which contains a metal flour child for the purpose of a manufacturing cost reduction and production time compaction. As the conventional manufacture technique of this electric-charge nature powder, it is proposed by Japanese Patent Application No. 80083 [one to].
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Effect

[Effect of the Invention] As explained above, since the manufacture technique of the electric-charge nature powder for circuit formation of this invention can make uniform the content of the metal particle of electric-charge nature powder, it has the effect that the good electric-charge nature powder of the printing nature which each powder is electrified uniformly and can print a uniform wiring pattern at the time of electrophotography printing can be obtained.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] By the manufacture technique of the electric-charge nature powder for the conventional circuit formation mentioned above, since it is difficult to distribute a metal particle uniformly in a thermofusion nature resin at the time of kneading, it becomes the electric-charge nature powder with which what has the excessive content of the metal particle 1, the thing which run short as shown in **Error! Bookmark not defined.** (B), and the thing which is not contained at all as shown in **Error! Bookmark not defined.** (C) were intermingled after trituration and classification as shown in **Error! Bookmark not defined.** (A).
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[0007] Consequently, a fogging is produced to a wiring pattern and there is a trouble of becoming the short-circuit during a wiring and the cause of a fall of insulation resistance, or producing a break and a blur to a wiring pattern and becoming an open circuit of a wiring and the cause of resistance increase.
[0008] It is in the purpose of this invention offering the manufacture technique of the electric-charge nature powder for circuit formation of equalizing the content of the metal particle to electric-charge nature powder, and an electric-

charge control agent conventionally, and having enabled it to obtain a uniform wiring pattern the trouble mentioned above being solved.

MEANS

[Means for Solving the Problem] The manufacture technique of the electric-charge nature powder for circuit formation of this invention is equipped with the process which mixed the metal particle, the thermofusion nature resin particle, and the electric-charge control agent particle and which carries out afterbaking pressurization and is used as the press field, and the process which pulverizes and classifies the aforementioned press field and is used as powder, and is constituted.

EXAMPLE

[Example] Next, the example of this invention is explained with reference to a drawing.
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[0012] First, the metal particle and thermofusion nature resin particle which are the material of electric-charge nature powder, and an electric-charge control agent particle are mixed.
[0013] At this time, a mean particle diameter is 0.5 as a metal particle. A mean particle diameter uses the azo system metallized dye which is about 4 micrometers in the silver dust end of the shape of flakes of mum as the particle which pulverized a styrene-acrylic copolymer and low molecular weight polypropylene with the jet mill, and set the mean particle diameter to about 5 micrometers as a thermofusion nature resin particle, and an electric-charge control agent particle.
[0014] This is blended by the weight ratio of 80:19:(styrene-acrylic copolymer:low-molecular-weight-polypropylene =18:1) 1, and carries out distributed mixture uniformly by the high speed mixer (process 11). The homogeneity of the content of the metal impalpable powder to electric-charge nature powder is mostly determined at this process, and becomes as good [the particle diameter of each material] as the parvus.
[0015] Next, this is put into metal mold, heating pressurization is carried out with a heated type press machine, and it considers as the press field (process 12).
[0016] Next, after carrying out coarse grinding of this press field by the cutter mill (process 13) and pulverizing it with a jet mill (process 14), it classifies and the electric-charge nature powder whose mean particle diameter (process 15) is about 15 micrometers is obtained. **Error! Bookmark not defined.** is a ** type view of this electric-charge nature powder. The metal particle 1 and the electric-charge control agent 3 are distributing uniformly in the thermofusion nature resin 2.
[0017] **Error! Bookmark not defined.** (A) is drawing showing the microphotography of the cross section of the Plastic solid in this example, and **Error! Bookmark not defined.** (B) is drawing showing the microphotography of the cross section of the kneader kneading object in the conventional technique. The dispersibility of the silver in the Plastic solid by this example is very good compared with the dispersibility of the metal particle in the kneader kneading object in the conventional technique.
[0018] The **Error! Bookmark not defined.** (A) and (B) are the particle-size-distribution views by the Coulter counter of the electric-charge nature powder by this example, and the **Error! Bookmark not defined.** (C) and (D) are the particle-size-distribution views of the electric-charge nature powder by the conventional technique. Since a classification is a draft method and it is strongly influenced of the specific gravity of electric-charge nature powder, the degree distribution of grain with the uneven content of the metal particle of electric-charge nature powder becomes large, and a uniform particle size is not obtained. Compared with the electric-charge nature powder by the conventional technique, since the content of a metal particle is uniform, particle size distribution (the **Error! Bookmark not defined.** (A) and (B)) are narrow, and the electric-charge nature powder by this example has good influence also on printing nature.
[0019] This electric-charge nature powder was printed on the ceramic green sheet by the electrophotography method using the ferrite system carrier, and was used as the ceramic substrate a disconnection, a laminating, and by calcinating. The sheet resistance of the circuit of this ceramic substrate was 2-3mohm and about [conventional] 1/5.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

Error! Bookmark not defined. It is the process flow view showing one example of the manufacture technique of the electric-charge nature powder for circuit formation of this invention.

Error! Bookmark not defined. It is the cross section of the electric-charge nature powder obtained by the manufacture technique of the electric-charge nature powder for circuit formation of this example.

Error! Bookmark not defined. It is the process flow view of the conventional technique.

Error! Bookmark not defined. (A) - (C) is the cross section of the electric-charge nature powder obtained by the conventional technique.

Error! Bookmark not defined. Drawing showing the microphotography of the cross section of the press field of electric-charge nature powder which manufactured (A) by this example, and (B) are drawings showing the microphotography of the cross section after kneading of the electric-charge nature powder manufactured by the conventional technique.

Error! Bookmark not defined. (A) And the particle-size-distribution view of electric-charge nature powder which manufactured (B) by this example, (C), and (D) are the particle-size-distribution views of electric-charge nature powder which manufactured by the conventional technique.

[Description of Notations]

1 Metal Particle
2 Thermofusion Nature Resin
3 Electric-Charge Control Agent
11-15 Process

有性が均一であるので粒度分布（図6（A）および（B））が狭くなっており、印刷性にも好影響を与える。

【0019】この荷電性粉末を、フェライト系キャリアを用いて電子写真方式でセラミックグリーンシート上に印刷し、切断、積層、焼成することによりセラミック基板とした。このセラミック基板の回路のシート抵抗値は2～3mΩと従来の1／5程度であった。

【0020】

【発明の効果】以上説明したように、本発明の回路形成用の荷電性粉末の製造方法は、荷電性粉末の金属微粒子の含有量を均一にできるので、電子写真印刷時に各粉末を均一に帯電させ均一な配線パターンを印刷できる印刷性の良好な荷電性粉末を得ることができるという効果を有している。

【図面の簡単な説明】

【図1】本発明の回路形成用の荷電性粉末の製造方法の一実施例を示す工程フロー図である。

【図2】本実施例の回路形成用の荷電性粉末の製造方法により得られる荷電性粉末の断面模式図である。

【図3】従来の方法の工程フロー図である。

【図4】（A）～（C）は従来の方法で得られる荷電性粉末の断面模式図である。

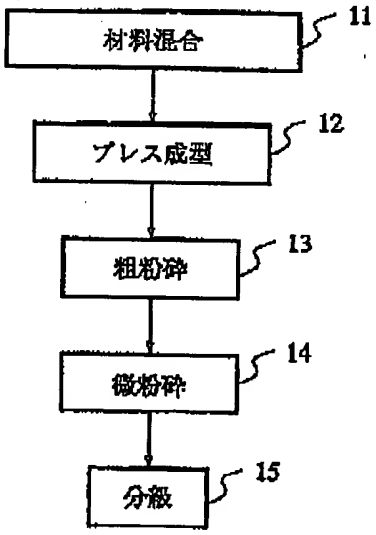
【図5】（A）は本実施例で製造した荷電性粉末のプレス体の断面の顕微鏡写真を示す図、（B）は従来の方法で製造した荷電性粉末の混練後の断面の顕微鏡写真を示す図である。

【図6】（A）および（B）は本実施例で製造した荷電性粉末の粒度分布図、（C）および（D）は従来の方法で製造した荷電性粉末の粒度分布図である。

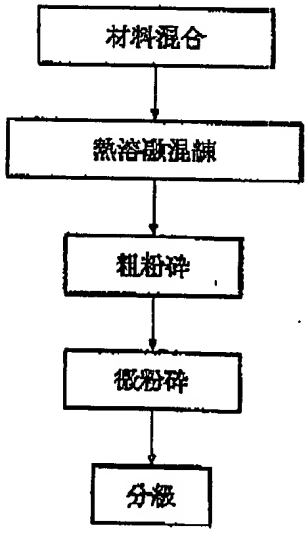
【符号の説明】

1　金属微粒子
2　熱溶融性樹脂
3　荷電制御剤
11～15　工程

【図1】

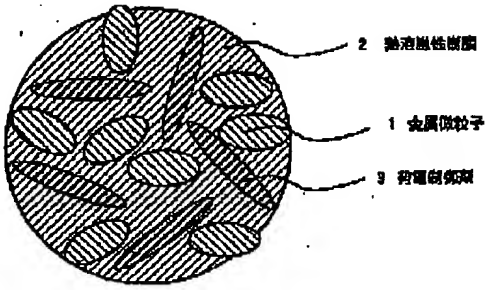


【図3】



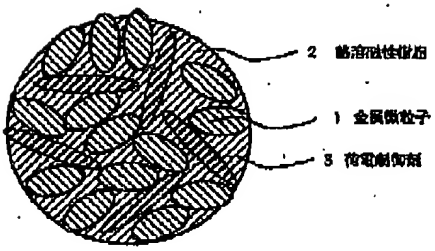
11~15：工程

【図2】



【図4】

(A)



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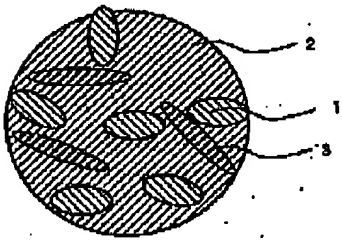
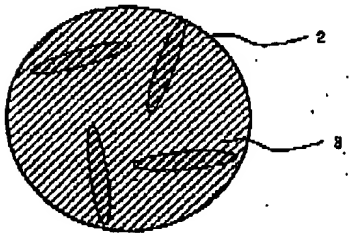
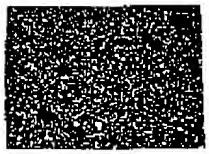


(C)



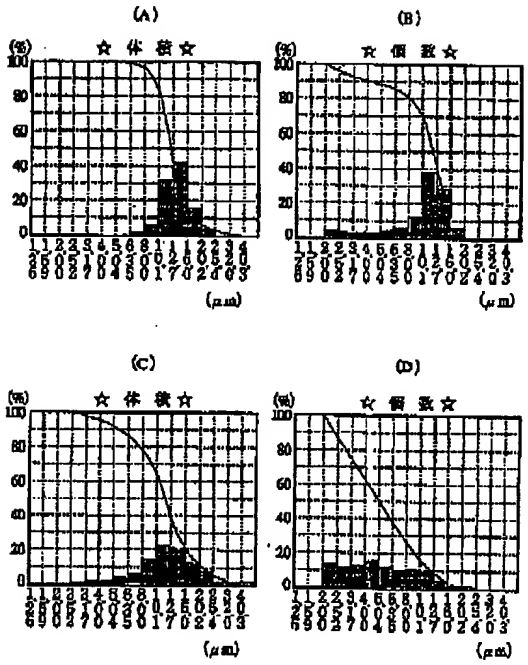
【図5】

(A)



(B)

【図6】



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